Lynnwood Bridge Office Park, 2nd Floor, Bloukrans Building,
4 Daventry Street, Lynnwood Manor, Pretoria

Private Bag X03, Gezina, 0031, South Africa

Tel: +27 (0)12 761 9300
Fax: +27 (0)12 331 2565
Email: info@wrc.org.za
Web: www.wrc.org.za

WATER RESEARCH COMMISSION

RESEARCH, DEVELOPMENT AND INNOVATION PRIORITIES FOR THE 2021 ANNUAL CALL FOR PROJECT PROPOSALS

The WRC hereby announces the Annual Call for project proposals for the financial year commencing on 1 April 2022. All annual project budgets will be required to coincide with the WRC's financial year which is from 1 April to 31 March. The start and end dates of project contracts are however flexible. Project proposals in response to both the **Open Call** and the **Directed Call** can be submitted on-line from 1 June 2021.

Please familiarize yourself with the information below and in the two WRC **Guidelines for Writing WRC Proposals**, before you start preparing an application. Please note further that the WRC does not prescribe hourly, daily or any other rate for proposers and prospective project teams. Also, *In order to stimulate ingenuity and competitiveness, the WRC has intentionally omitted budgets from this Call.*

The **deadline** for the submission of both **Open and Directed proposals** is **31 July 2021 at 23:59**. Please ensure that proposals are completed well in advance of the deadline as the volume of last-minute submissions could affect the efficiency of the system. An electronic helpdesk bms-support@wrc.org.za (08:00 – 16:00 on week days) is available should you encounter any problems in completing or submitting the proposal submissions online.

OPEN CALL

KSA 1: WATER RESOURCES AND ECOSYSTEMS

The following Themes in the Thrusts and Programmes are available for Open Call proposals in KSA 1 with an indication of research priority areas for each Programme. Please contact the Executive Manager, Dr Shafick Adams (E-mail shaficka@wrc.org.za).

Thrust 1: Governance and Institutional Arrangements
Programme 1: Cooperative governance for water resource management Priority will be given to proposals that address any of the following: Pathways for interim water service provision through institutionalising supported self-supply, including institutional, financial, regulatory, and technical considerations.
Programme 2: Policy, science, and implementation Priority will be given to proposals that address any of the following: (1) Policy implementation as an area of research focus, including the political economy of water and opportunities for embedded research. (2) Integrity in the water sector.
Programme 3: Water pricing and financing No specific themes
Programme 4: Gender and equity Priority will be given to proposals that address any of the following: Review of experience to date in implementing compulsory licencing.
Programme 5: Operation & maintenance Priority will be given to proposals that address: Governance arrangements for improved operation and maintenance of groundwater schemes (including real-time management).

THRUST 2: HYDROLOGICAL AND ECOSYSTEM PROCESSES
Programme 1: Eco and socio-hydrology No specific themes
Programme 2: Data and hydroinformatics Priority will be given to proposals that address: (1) Enriching the water research observatory from an ecosystem perspective. Please enquire on available and ongoing projects in this area. (2) Updating information on water use, availability and demand and near-real time displays using automated infographics. (3) A comprehensive critical review of data collection and curation in South Africa. (4) Recover all data/information (including metadata) on reserve determinations funded by DWS/WRC into a database. (5) Downscaling and upscaling of available data for improved decision-making. (6) Opportunities to incorporate infrastructure from other sectors to improve spatial and temporal water and weather data collection (i.e. ICT, transport, energy, etc.).
Programme 3: Catchment Processes Priority will be given to proposals that address: (1) Development of model catchment(s) to integrate research and operational data and information towards holistic management of catchments. (2) Surface-groundwater interaction along priority water source areas.
Programme 4: Water Security Priority will be given to proposals that address: Development of water security indices at a variety of scales and users
THRUST 3: WATER RESOURCE AND ECOSYSTEM PROTECTION AND UTILIZATION
Programme 1: Resource directed measures No specific themes
Programme 2: Rehabilitation and conservation Priority will be given to proposals that address: Development and testing business propositions for the restoration of catchments.
Programme 3: Water system utilisation and augmentation No specific theme
Programme 4: Environmental Economics and resource accounting Priority will be given to proposals that address: Nature-based solutions through sustainable development of the market value of leading plant species in the medicinal field, with a focus on artemisia and/or cannabis. Research on verification of the medicinal value of these plants has been widely talked about, but not proven through latest procedures as professionally required for human use.
THRUST 4: ENVIRONMENTAL CHANGE AND ADAPTATION THRUST
Programme 1: Urbanization Priority will be given to proposals that address: Integration of green infrastructure (GI) and GI asset management into municipalities.

Programme 2: Climate change and variability Priority will be given to proposals that address: (1) Improving understanding of the marine/coast pelagic ecosystems response to climatic changes, as well as modeling the future of fisheries, eco-tourism, and improved estuarine management options. (2) Also see Thrust 6 Programme 6.
Programme 3: Landuse planning and changes Priority will be given to proposals that address: (1) Impact of landuse management and changes on water resources. (2) Managing various water sources adaptively over time to improve water security and resilience.
Programme 4: Environmental risk and disaster management No specific themes
THRUST 5: RESOURCE QUALITY AND MANAGEMENT
Programme 1: Water pollution, depletion and human health Priority will be given to proposals that address: The integration of emerging contaminants into human health risk-based water quality guidelines for freshwater and in estuaries.
Programme 2: Emerging contaminants No specific themes
Programme 3: Source water protection No specific themes also see Thrust 6 Programme 5.
THRUST 6: WATER RESOURCES INNOVATION AND TECHNOLOGIES
Programme 1: Apps, online. Priority will be given to proposals that address: (1) Support of technologies and in citizen science tools development, training and their implementation in the context of disasters. (2) Understanding the costs implications to engaging (or not) new technology in future water resources monitoring.
Programme 2: Remote sensing and telemetry Priority will be given to proposals that address: (1) Novel drone/ technologies and applications in water resources assessments and monitoring. (2) Proposals that integrate remote sensing data and information with land-based monitoring to improve spatial and temporal coverages.
Programme 3: Environmental Sensors & Detectors No specific themes
Programme 4: Models and Early warning systems No specific themes
Programme 5: Treatment Technologies Priority will be given to proposals that address**:** In-situ treatment technologies to improve water quality within the landscape before it reaches water sources or treatment plants.
Programme 6: Blue-Green technologies and infrastructure Priority will be given to proposals that address: (1) Development of implementation guides for managed aquifer recharge at local settlement and government level. (2) Update and review of managed aquifer recharge activities and potential for climate change adaptation.

KSA 3: WATER USE, WASTEWATER RESOURCES AND SANITATION FUTURES KEY STRATEGIC AREA

The following Themes in the Thrusts and Programmes are available for Open Call proposals in KSA 3 with an indication of research priority areas for each Programme. Please contact the Executive Manager, Mr Jayant Bhagwan (E-mail jayb@wrc.org.za).

THRUST 1: WATER SENSITIVE AND RESILIENT SETTLEMENTS
The scope of this thrust is to influence the planning and design of smart human settlements and environments that is sensitive to the issues of water sustainability and environmental protection, while ensuring the efficient functioning of water service institutions and their viability are key to sustaining water services in rural and urban areas. The thrust need to promote a holistic management of sewerage, stormwater and drinking water to achieve the goal Integrated Water Management (IWM) and a water supply mix.
Programme 1: *Smart water supply management*
Theme : The scope of this programme will focus on introducing new techniques and process, such as ICT, smart grids etc. in improving the technology for supplying water. It will give attention to better infrastructure asset management, energy management and generation, water loss minimisation, smart metering and all elements that will ensure secure and safe supply of water of good quantity and quality. Aligned to this will be improving management arrangements in achieving these outcomes
Programme 2: *Sustainable drainage futures*
Theme : Currently the coordination of greywater, rainwater, sewerage and stormwater as an important resource mix in settlements is not well understood. Thus, the scope of this thrust will contribute to ensuring that the collection of water management practices align to modern drainage systems with natural water processes. Focus will be given to SuDS efforts make urban drainage systems more compatible with components of the natural water cycle and catchments, while modernizing monitoring and asset management systems towards development of a resource mix . *Theme 1 : Understanding the impact of land use on water services in tribal, trust and private land.*
Programme 3: *Water efficiency and behaviour change*
Theme : A fully-informed and empowered community or individual plays a vital role in the sustainable use of water services, which contributes to water efficiency and improved environmental health. This programme will address education and awareness aspects which contribute to efficient water use, improved behaviour and sustainable services. It will support the development of innovative tools, technologies and systems which contribute to water efficiency and behaviour change.
Programme 4: *Water services Institutional and management programme*
Theme : Relationships and partnerships between service providers, both external and internal, are important prerequisites to sustainable water service delivery. This programme's objective is to generate knowledge and processes that would support this new form of service delivery. Innovative management techniques are a necessity for viable and sustainable water service provision. This programme intends to find innovative solutions to critical problems with the financing, cost recovery, regulation and management of essential services such as water supply and sanitation
THRUST 2: WATER QUALITY FUTURES
The research focus of this thrust is on improving understanding of the influence of major drivers (i.e. climate change, industrialisation, land use/cover, etc), as well as anthropogenic activities on water quality changes in raw water and treated water sources for different uses including; drinking; and agricultural and industrial uses. Research on contaminant sources, loads, transport and partitioning and as well as their combined impacts is also

key in determining appropriate risk management scenarios and developing the appropriate water quality management responses such as tools/technologies and regulatory/policy instruments.
Programme 1: *Smart water quality monitoring and decision making*
Theme 1: Development of innovative methods/models for detecting and monitoring water quality changes; sources, transport and partitioning of contaminants between the water component and sediment, and the subsequent use of the information for decision making
Theme 2: Development of decision support systems, knowledge hubs and cataloguing platforms for water quality information
Programme 2: *Water quality regulation, compliance and reporting*
Theme 1: Development of customized manuals and for drinking water quality management to support compliance to regulations and achieve capacity development.
Programme 3: *Risk assessment for environmental water quality management*
Theme 1: Development and application of quantitative and comparative risk assessment, integrated human and ecological risk assessment approaches, as well as risk perception and communication methodologies for water quality assessment
Programme 4: *Emerging issues and substances of concern in water*
Theme 1: Integration of state-of-the-art analytical and environmental forensic technologies for identifying, and studying the sources, concentrations, transport and fate of emerging substances of concern within the urban water cycle
Programme 5: *Innovations in water treatment technologies*
Theme 1: Development and demonstration of innovative technological solutions for water purification, clearly demonstrating primary linkages and trade-offs between energy use efficiency (and cost), as linkages to better outcomes in terms of health
THRUST 3: SUSTAINABLE INTEGRATED WASTEWATER RESOURCES FUTURES
The scope of this thrust is to address wastewater as a resource, encourage the valorisation, reuse of wastewater effluents and promote sustainable integrated wastewater management through reducing pollution, removing pollutants, reusing/recycling reclaimed water and recovering useful resources. The thrust is premised on a paradigm shift from current wastewater management practices, catalysing achievement of sustainable development goals (SDGs) and need to transition the water sector to a circular economy. The thrust therefore prioritizes research, development and innovation that deliver the required solutions, innovations, processes and interventions at scale.
Programme 1: *Quantification and Minimization of Water Use and Effluent Production*
Theme 1: Regulations, Best practices, Approaches and Tools Promoting Pollution Prevention at Source
Programme 2: *Effluent Treatment, Valorisation and Reuse*
Theme 1: New and Emerging Low Energy (Energy efficient) Treatment Options for Sustainable Wastewater Management
Theme 2: Approaches and Best Practices for Sustainable Wastewater Management
Programme 3: *Advanced Technologies and Processes for Resource Recovery*
Theme 1: Approaches, Tools and Innovations for Maximum Resource Recovery from Wastewater(s).
Programme 4: *Nature-based Tools, Solutions and Innovations*
Theme 1: Nature-inspired Innovations and Solutions for Sustainable Wastewater Management.

Programme 5: *Sustainable Mine Closure Management*
Theme 1: Approaches, Tools, Innovations and Practices for Sustainable Mine Closure.
THRUST 4: THE SANITATION TRANSFORMATION INITIATIVE
The scope of this thrust is to provide impetus to the development of non-sewered sanitation solutions which would assist sanitation service providers to be more efficient and cost-effective. The focus on non-sewered sanitation is designed to move away from current linear approach to a circular approach through development of innovations and models that promote cost-effectiveness and longevity of infrastructure investment in which re-use, recovery and recycling through the sanitation value chain are promoted. The thrust support acceleration of sanitation provision through innovative technologies and approaches; minimising health risk through use of toilets; recycling / re-using limited resources, meeting user experience and acceptance; minimising environmental pollution; and linking sanitation infrastructure to additional revenue streams from valorisation of faecal wastes.
Programme 1: *Re-Engineered Toilets*
Theme 1: New and Emerging Off-grid / Resource Recovery Toilets
Programme 2: *Sanitation-Sensitive Design (SSD)*
Theme 1: New institutional and municipal financial, planning, and management models centred around Sanitation Sensitive Design (including circular economy)
Theme 2: Training, education and awareness aspects which contribute to sanitation sensitive design
Programme 3: *Municipal Sludge Valorisation*
Theme 1: Approaches, Tools, Practices and Innovations for municipal sludge valorisation
Programme 4: *SaniBus – Sanitation Linked Business*
Theme 1: Business-driven Approaches, Tools, Innovations and Practices for Sanitation

KSA 4: WATER UTILISATION IN AGRICULTURE

The following Themes in the Thrusts and Programmes are available for Open Call proposals in KSA 4 with an indication of research priority areas for each Programme. Please contact the Executive Manager, Prof Sylvester Mpandeli (E-mail sylvesterm@wrc.org.za).

THRUST 1: WATER UTILISATION FOR FOOD, FORAGE AND FIBRE PRODUCTION
Programme 1: Water-efficient production methods in relation to soils, crops and technology in rain-fed and irrigated agriculture
Theme: Water use and productivity of emerging high value horticultural crops such as blueberries and strawberries under shade nets
Theme: Determine water use of tomato crop in Limpopo Province
Theme: Determine water requirements of high yielding pear orchards
Theme: Water use of Banana crop in different agro - ecological zones

THRUST 2: WATER UTILISATION FOR FUELWOOD AND TIMBER PRODUCTION
Programme 1: ***Water-efficient production methods and systems in agro-forestry, woodlands and forestry plantations***
Theme: Quantifying water use of invasive alien forests at high altitudes
THRUST 3: WATER UTILISATION FOR POVERTY REDUCTION AND WEALTH CREATION IN AGRICULTURE
Programme 1: Sustainable water-based agricultural activities in rural communities
Theme: The contribution of water, energy and food to local economic development in rural areas of South Africa
Theme: Development of a remote sensing based spatial model to map cultivated areas and estimate crop water use and crop yield.
Theme: Upscaling of school based vegetable gardens in Gauteng, Limpopo and Mpumalanga Provinces
Programme 2: Integrated water management for profitable farming systems
Theme: Developing a database and utility tool for underutilised indigenous crops for increased agricultural diversification in South Africa
Theme: Develop a fit for purpose guideline product for smallholder farmers and informal trade in different environment
Theme: The effect of decadal climate variability on available water for irrigation
THRUST 4: WATER RESOURCE PROTECTION, RESTORATION AND RECLAMATION IN AGRICULTURE
Programme 1: Sustainable water resource use on irrigation schemes and within river catchments
Theme: Using unmanned aerial vehicle high-throughput phenotypic platforms (UAV-HTPPs) and Miniaturized Remote Sensing Capabilities for precision agriculture for improved water use and productivity
Theme: Develop and implement water management scenarios at both local/basin and national scales.
Programme 2: Impact assessment and environmental management of agricultural production
Theme: Economic optimisation of water and energy for sustainable food and nutrition security
Theme: Analysis of virtual water flows, water footprint and water savings from the trade of livestock and crop products of South Africa

DIRECTED CALL

KSA 1&2: WATER RESOURCES AND ECOSYSTEMS

The following Themes in the Thrusts and Programmes are available for Directed Call proposals in KSA 1&2:

Thrust 1: Governance and Institutional Arrangements
Programme 2: Policy, science and implementation Mobilising knowledge and capacity to support ongoing water law reform in South Africa. Budget: R400 000 Year 1: R100 000

THRUST 3: WATER RESOURCE AND ECOSYSTEM PROTECTION AND UTILIZATION
Programme 1: Resource directed measures Ecological infrastructure-climate change and economy nexus through revised present ecological state (PES) lens. Budget: R2 500 000 Year 1: R500 000

KSA 3: WATER USE, WASTEWATER RESOURCES AND SANITATION FUTURES KEY STRATEGIC AREA

The following project titles in the Thrusts and Programmes are available for Directed Call proposals in KSA 3:

THRUST 1: WATER SENSITIVE AND RESILIENT SETTLEMENTS	**Budget 2022/23 (R)**	**Total Budget (R)**
Programme 1: Smart water supply management		
Title 1: Scoping study to transition Municipalities into a smart water management model within the current legislation environment.	250 000.00	450 000.00
Title 2: Exploring next generation water loss tracking, compliance, management and performance solutions.	250 000.00	450 000.00
Title 3: Smart water metering, trends, opportunities, risks and policy.	250 000.00	450 000.00
Programme 4: Water services Institutional and management programme		
Title 1: A survey into the municipal water by-laws and its application in terms of improving the water services environment.	300 000.00	500 000.00
Title 2: The DDM model and its implications on Water Services Legislation, planning and regulation.	300 000.00	500 000.00
Titel 3: Towards a systematic review of the Water Services Authority model: consolidation of existing knowledge, capturing successes and failures, and identification of gaps for future research, to inform an evidence-based approach for future improvement	300 000.00	600 000.00
THRUST 2: WATER QUALITY FUTURES		
Programme 4: Emerging issues and substances of concern in water		

Title 1: Scoping study on the use of water fingerprinting techniques for water pollution monitoring and assessment	800 000	2 000 000
THRUST 3: SUSTAINABLE INTEGRATED WASTEWATER RESOURCES FUTURES		
Programme 1: Quantification and Minimization of Water Use and Effluent Production		
Title 1: Natsurv 15: Water and wastewater management in the oil refining and re-refining industry (Edition 2) and update of Natsurv 4 on water and wastewater management in the dairy industry. *Title 2:* Natsurv 19: Water and wastewater management in the Winery Industry (Edition 1)	700 000 500 000	1 500 000 1 130 000
Programme 2: Effluent Treatment, Valorization and Reuse		
Title1: Piloting irrigation using partially-treated gold mine-impacted water as a long-term sustainable solution for mine water from the Witwatersrand Basins	1 000 000	3 000 000
Programme 3: Advanced technologies and processes for resource recovery		
Title 1: Piloting energy audits and energy efficiency as a climate change mitigation and adaptation strategy for the South African wastewater sector and framing its use in the Drop Certification Programme	700 000	1 500 000
THRUST 4: THE SANITATION TRANSFORMATION INITIATIVE		
Programme 2: Sanitation-Sensitive Design (SSD)		
Title 1: The Development of a Framework and Model for Designing Sanitation Sensitive Cities	300 000	600 000
Programme 3: Municipal Sludge Valorisation		
Title 1: Development of curricula for Non-Sewered Sanitation & Sludge Valorisation	250 000	500 000